turbance, while those of Etna and at Catania were much agitated. The steamer Guadeloupe felt two shocks in latitude 43° 45′ N. and longitude 5° 39′ E. at 6 A.M., and a third one at 8 A.M. At Cannes and Antibes the sea fell three feet at the moment of the chief shock, and then rose six feet. The seismoscope at Washington was disturbed at 7.33 A.M. On Feb. 24, slight shocks occurred at Mentone and at Digne (Departement des Basses Alpes), and on the following day at 1.53 A.M. a shock was reported from Nice, and at 2 and 4 A.M. from Cannes.

This earthquake occurred on the large fault on the south-western side of the Apennines. A glance at the map shows the difference between the declivities of the Apennines. North of Genoa the Molasse hills gradually rise from the plains of Piedmont, forming a continuous curve, which may be observed from here to the Bay of Taranto. Inside of this continuous belt we find limestone, forming the Abruzzo, Gran Sasso, and the Basilicata. This line is interrupted in Tuscany. Still farther inside, on the west coast, and partly submerged in the Tyrrhenian sea, we find the separated *débris* of the ancient crystalline rocks. Here is the great fault between the sunken tract now occupied by the Ligurian and Tyrrhenian seas and the mountains. It is marked by the long lines of volcanoes and countries of frequent seismical disturbances. The east side of the Apennines is regularly folded: the west side is torn, and a seat of volcanic and seismic action. The folded side is convex and continuous: the opposite one is broken by faults and sunken tracts. Inside of the Apennines there are a great number of sunken tracts arranged on a long line, the curved limits of which cut far into the range of mountains: the Gulf of Genoa, Salerno, Naples, and the bay around the Lipari Islands are the centres of regions of this kind. The movements of the strata along these faults give rise to the numerous violent earthquakes of western Italy.

LONDON LETTER.

The unsavory subject of the disposal of London sewage continues to attract much attention, and to create considerable interest. On three successive evenings the large theatre of the Institute of civil engineers has been crowded to excess to hear the discussion on papers by Messrs. Dibdin and Crimp on sewage-sludge and its disposal. The most telling speech was that of Dr. Meymolt Tidy, who, in a most incisive manner, delivered a heavy indictment against the Metropolitan board of works, on the ground, that, when forced by public opinion to do something to remedy the nuisance in the Thames, they summoned to their aid the very chemists who had previously given evidence before a royal commission to the effect that there was no sewage nuisance in the river! He ridiculed unsparingly the treatment by lime and ferrous oxide, and by sodium manganate, which had been adopted by the board, and also Mr. Dibdin's view that the ferrous oxide acted as a carrier of oxygen between the air and the sewage in which it was suspended. The idea that sewage could be 'made to pay' had done more than any thing else to restrict advances in the mode of dealing with it: such processes were like those for extracting silver out of sea-water. On another occasion the advocates of irrigation and sewage farms had their say at the Society of arts, where Dr. Alfred Carpenter gave his experiences of the Croydon sewage-farm, near London, which were very favorable. Such an opinion has especial value, as the author is well known as a distinguished sanitarian and medical officer of health. The local conditions for successful sewage-irrigation are not easily obtainable. There are, however, many places near American cities, within the knowledge of the present writer, where sewage-irrigation might be applied with the greatest advantage.

Another subject much before the scientific public at present is the employment of gas for lighting and heating. Mr. Colnaghi has lighted a small picture-gallery most efficiently by the gaslight system of Dr. von Welsbach of Vienna. The figures given are an average consumption in each burner of two feet per hour, at a pressure of nine-tenths of an inch, and an average illuminating-power of seventeen candles, or eight and a half candles per cubic foot of gas consumed. Within an ordinary atmospheric or Bunsen flame, is placed a mantle or hood of cotton net or webbing which has been previously steeped in a solution of oxides of zirconium and lanthanium. Mr. William Sugg, the well-known gas-engineer, lately gave a most successful gas-cooking demonstration, in which the non-luminous flame is abandoned in favor of the radiant heat from a luminous flame in a well-ventilated chamber. The gas-supply is regulated by a governor, and the results can be predicted to a nicety. The loss in roasting a joint is reduced from twenty-five per cent to eight or twelve. Neither the food nor the vessels containing it are touched by the flame: hence unpleasant flavors are avoided, and the whole apparatus, which is adaptable to many different culinary operations, has the merit of great simplicity. A very striking lecture, well illustrated, was recently given to the Manchester technical school, on 'Some curious flames,' by another gas-engineer, Mr. Thomas Fletcher. He strongly insisted, that, in the ab-

sence of a solid substance at a high temperature, it is impossible to cause combustion without flame, and that when a flame is used, it is impossible to make it touch a cold surface. The existence of this impassable cold zone was demonstrated by many curious experiments. and its practical consequences were pointed out. There was much of a deceptive character about the mere appearance of flame.

The New Zealand earthquake of June 10, 1886, and the destruction of the famous terraces, have lately come in for a large share of public attention; the Society of arts, the Geologists' association at their annual meeting, and the Geological society, having each recently devoted an evening to it. The readers of papers were respectively, Mr. Kerry Nichols, Mr. W. Lant Carpenter, Captain Hulton, and Mr. J. Martin. In the first two cases some marvellous photographs, taken by the search parties sent up during the eruption, were thrown on the screen. The hydrothermal character of the whole was well brought out, one striking view being that of a rent in the top of Mount Ruawhia, five hundred feet deep, six hundred yards across, and a mile and a half long, which was blown out in *three minutes.*

An unusual number of changes are in progress among the staff of the Natural history museum at South Kensington. During the past year the zoölogical department has lost the services of Mr. E. J. Miers and of Mr. J. J. Quelch, who had charge of the Crustacea and Zoöphytes respectively. The former gentleman, however, continues to do unofficial work in the museum; but Mr. Quelch has gone to Demerara as curator of the museum there. Mr. S. O. Ridley, who has done so much good spongiological work, is about to leave the museum and take orders. The geological department is also on the point of losing its two senior assistants. Mr. R. Etheridge, jun., will shortly return to the scene of his earlier scientific work in Australia, where he has received the appointment of paleontologist to the Australian museum and the department of mines at Sydney. The geological department will suffer considerably by the loss of his accurate and comprehensive knowledge of invertebrate paleontology, and his wide experience in the arrangement of fossils for exhibition. It is not too much to say that in this latter respect the British museum is far in advance of any other museum in Europe, as is universally admitted by our continental visitors; and for this result the museum authorities are very largely indebted to the care and skill of Mr. Etheridge. Almost the same may be said of Mr. W. Davies, who is about to retire on a well-earned pension, after a prolonged period of service, during which he has had charge of the fossil vertebrates. Although he has published little, he has done very much for vertebrate paleontology, both in the preparation of specimens for investigation and exhibition, and from the unselfish way in which his extensive knowledge has always been unreservedly communicated to other workers. Many important observations which are recorded in paleontological memoirs by various authors are in reality due to the work of Mr. Davies, though this fact has not always been made known by the writers of the memoirs in question.

The *Zoölogical record*, the future existence of which has been in danger of late, is now to have a new lease of life. For some time past the subscription-list has not sufficed to pay the working expenses, and negotiations were set on foot with Dr. Anton Dohrn, in order, if possible, to bring about a union of the *Record* with the later established *Zoologischer Jahresbericht.* These have fallen through, however, and so the Zoölogical society is about to undertake the publication of the *Record.* It will remain under the able editorship of Prof. F. J. Bell, who has brought out the last few volumes. These have appeared within the year succeeding that of which the literature is recorded; and in this respect the English work has the advantage of its German companion, which is, however, much more comprehensive in its scope.

Fermentation in relation to bread-making has been investigated by Mr. W. Jago, who communicated his results to a recent meeting of the London section of the Society of chemical industry. Discarding entirely the prevalent idea that the main object of the fermentation was the aeration of the bread, he described an apparatus, and the results obtained by its use, for comparing the amount of fermentation produced under the same conditions in various elements of the flour separately (e.g., gluten, starch, aqueous extract, etc.), by measuring the amount of carbon dioxide evolved from the same weights in the same periods. The ferment employed in all cases had been the pressed distillers' yeast, usually obtained from rye. It was elicited in the discussion which followed, that both the author and others were engaged in investigating the separate actions of the different kinds of ferments to be found in bakers' yeast, and, in fact, in endeavoring to put the chemistry of panifaction on the same sound basis as that recently established for the fermentation of beer. These results will be looked for with much interest.

At the same meeting the first scientific data were given about the recent English-grown tobacco. The percentage of ash was very much

higher than in either American or German tobacco, indicating that the plant had been much 'forced;' and it contained much more lime than usual in proportion to the potash and soda, as well as a high percentage of chlorine. Moreover, water extracted one-third more of soluble matter from English than from American tobacco.

It may be worth noting that this society has now nearly three thousand members, that its journal is entering on its sixth volume (published monthly under the direction of a committee), and that its aims are perfectly distinct from the Chemical society, which deals with pure science, and from the Institute of chemistry, which is mainly an association, for professional and self-protective purposes, of analytical chemists.

A paper on 'Telephonic investigations,' by Prof. S. P. Thompson, is giving rise to three nights discussion at the Society of telegraph engineers and electricians, of which the veteran Sir Charles Bright is now president. The paper, which is well worthy of attentive study, contained an almost exhaustive classification of telephonic transmitters, receivers, and transformers, — an account of the author's numerous researches thereupon, and especially of his 'valve' telephone, — and an elaborate discussion of the effect of heat in microphonic contacts. The author concluded with the following sentences, upon which the discussion mainly turned: "In conclusion, I would reiterate my conviction that the success of long-range telephony depends upon the possibility of devising instruments which, on the one hand, can be used with higher battery power to transmit stronger currents, and which, on the other hand, will be adapted to receive these currents by means of apparatus which, though not necessarily more sensitive to small currents than the present receivers, will have a higher electrical and mechanical efficiency. And I am convinced that the path of progress lies very near the road already travelled by those who have perfected the existing machinery for the electric transmission of power."

The direct opposite of this was very stoutly maintained by Mr. Preece, head electrician of the post-office telegraphs, who argued that both on theoretical grounds, — viz., that, in Sir W. Thomson's law, the value of a in the equation

$$a = CKrl^2$$

was independent both of current and of electro-motive force, — and also as the result of practical experiments, a great number of which were quoted, long-distance telephony was a question, not of instruments, but of line.

At the annual meeting of the Physical society of London, held this afternoon, Prof. Balfour Stewart was re-elected president, and Dr. E. Atkinson, who for many years has been treasurer, was elected a vice-president, while Prof. A. W. Rücker (the recently appointed successor to the late Professor Guthrie at the Science schools, South Kensington) was appointed treasurer. The society adopted an alteration of its rules, whereby membership of a foreign or colonial scientific society shall in future be held equivalent to the personal knowledge, on the part of members of the society, of candidates for its membership. W.

London, Feb. 12.

GEOGRAPHICAL NOTES.

Africa.

The latest letter of Dr. O. Lenz is dated December, 1886. On June 30 he left Kasonge, which was being ravaged by small-pox. After he had left the village the disease broke out among his caravan, and among those who died of it were his own and Bohndorf's servants. On the 7th of August he reached the Tanganyika, where he met with the English missionaries. He crossed the lake to Ujiji, whence he wished to go north. However, on account of the war between the Arabs and northern tribes, he was unable to continue his journey, and was obliged to proceed towards the east coast. He did not follow the well-known route from Ujiji to Bagomoyo, but chose the Zambezi route. He crossed the land between the Tanganyika and Nyassa, went by boat over Lake Nyassa and down the Shire and Zambezi. Having reached Kwilimane at the mouth of this river, he embarked for Zanzibar. His arrival there was announced a short time ago.

Le mouvement géographique of Feb. 15 contains an interesting sketch-map of the district north of the Kongo by A. J. Wauters, showing the present state of our knowledge of the hydrography of that country according to the explorations of Junker, Grenfell, Lupton Bey, and Flegel. The Welle-Makua has been copied from a sketch furnished by Dr. Schweinfurth, and shows the important discoveries of Dr. Junker.

Stanley has left Zanzibar for the Kongo. At the same time the famous Arabian trader Tippo-Tip started for Stanley Falls, and has promised to support Stanley's expedition.

The January number of the *Bulletin* of the Paris geographical society contains an accurate map of the Ogowe in West Africa by Lieutenant Mizon, and of his return journey to the coast. In the paper which accompanies the maps, Mizon describes the methods of observation, and gives the positions of some of the more important points. The maps are on the scale of about one kilometre to an inch, and contain a great deal of topographical and orographical detail.